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B-52 aircraft to adopt AFRL-developed hydraulic fluid

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WRIGHT-PATTERSON AIR FORCE BASE, Ohio — A fire-resistant hydraulic fluid developed by Air Force Research Laboratory Materials and Manufacturing Directorate experts will now be used in more than 90 percent of B-52 bomber components, increasing the aircraft's survivability and operational safety.

In the past, B-52s used a flammable, petroleum-based hydraulic fluid, according to C. Ed Snyder of the directorate's fluids and lubricants group. The replacement fluid has a higher flash point and reduced flammability, key to safety in flight. It also allows aircraft to operate at temperatures as low as minus 65 degrees Fahrenheit, and in high temperature environments for extended periods of time.

"The hazards associated with the flammability characteristics of hydraulic fluids are well known," Mr. Snyder said. "They are required to function in high pressure hydraulic systems in the presence of a variety of ignition sources."

Though fire resistant fluids will burn, Mr. Snyder said they are significantly more difficult to ignite and are much less likely to spread a fire after ignition than a non-fire resistant fluid.

Jimmy Vo, a B-52 systems engineer at Oklahoma City Air Logistics Center, said revisions to the B-52 technical orders, reflecting the new hydraulic fluid requirement, will be official by January 2005. Experts will also conduct tests to determine if the landing gear struts and wing tip protection struts can be converted to the fire-resistant fluid.

Hydraulic fluids are critical to the safety of flight material for all Air Force aircraft. Hydraulically actuated mechanisms operate a large number of aircraft functions, including highly sophisticated flight controls, landing gear operation, control of rudder flaps and accessory door actuation, Mr. Vo said. Hydraulic fluids also lubricate aircraft systems and reduce heat generated during operation.

Nonstructural material experts from the directorate's fluids and lubricants group dedicated significant research and develop-



A B-52 was used to test an AFRL developed fire-resistant hydraulic fluid

ment activities to preventing hazards caused by hydraulic fluids. Two synthetic hydrocarbon based fire resistant hydraulic fluids were successfully developed to meet this requirement and were compatible with the systems and design of aircraft, including the B-52.

A materials and development program in the 1960s and 1970s led to development of the new fluid so that it is compatible with, and an appropriate drain-and-fill replacement for the older petroleum-based product. It also didn't require any type of retrofit of hydraulic system materials or components, Mr. Snyder said.

Officials initially authorized converting all Department of Defense aircraft to this fluid except for aircraft required to be airborne on short notice. Those aircraft were not converted because the viscosity of older fluid was higher at minus 65 degrees Fahrenheit than was the new product.

Mr. Snyder said aircraft using the new product were found to require longer warm-up times for the flight controls before the aircraft could take-off—a phenomenon that was considered unacceptable—so those aircraft continued to use the flammable fluid.

Subsequently, a requirement developed for a compatible,

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drain-and-fill replacement for the old, flammable hydraulic fluid that would have the same low temperature operational capability, but would also offer improved fire resistance.

AFRL experts developed the new fluid, based on a modified synthetic hydrocarbon polyalphaolefin and a similar additive package, and extensive testing and evaluation proved it is an appropriate replacement for the older, flammable hydraulic fluid in all military and some small commercial aircraft.

“Based on thermal stability measurements, fluid film thickness, and volatility, (the new fluid) is usable in low and high temperature environments for extended periods of time and is significantly less flammable,” said Lois Gschwender, a fluids and lubricants group member.

“With conversion of the B-52 to a fire resistant hydraulic fluid, only a few Air Force aircraft still use the flammable fluid,” Ms. Gschwender said. “We are hoping they will convert to one of the safer, superior performance, fire resistant hydraulic fluids in the near future.” @